XXXIII.—*Contributions to our Knowledge of the Spongida.* By H. J. Carter, F.R.S. &c.

[Plates XXV.-XXVII.]

The following contributions to our knowledge of the Spongida consist of more or less illustrated descriptions of nineteen new species taken from one wet and eighteen dry specimens, together with the types of two new groups of flesh-spicules (viz. *Spinispirula* and *Sceptrella*) and a few of their varieties respectively.

Although the spiculation in most instances is exquisitely beautiful, as may be seen by the representations in the Plates, yet the soft parts of only one species, viz. *Axos spinipoculum*, from Australia, which was taken alive and immediately put into preservative fluid, have admitted description and delineation, whereby, however, not only features of unusual interest have been elucidated, but additional testimony afforded of how much more is to be gained by dissecting a specimen in this condition than after desiccation.

As regards the measurement of sponge-spicules, it should be remembered that they must be small before they can be large, and that therefore, as they are successively developed, there must be all sizes present; further, that the spicule generally loses in length what it gains in thickness, so that, in the matured forms, the thicker are shorter than the more slender ones; and, lastly, that the maximum size may differ with the specimen. Hence my measurements are taken from the *average* largest size in all respects of the specimen examined, and therefore can only be considered approximative.

In the matter of form, too, the terms "gradually" and "abruptly," applied to the pointing of the spicule, mean that in the former case it is gradual and in the latter sudden.

HOLORHAPHIDOTA, Cart.

Family 2. **Suberitida**, Cart.

Genus Axos, Gray (1867).

In 1864 Dr. Bowerbank (Mon. Brit. Spongiadæ, vol. i. pl. x. fig. 197) gave a representation of a spicule which, at p. 260 (ib.), is stated to have come from a "very beautiful branching sponge from Nicol Bay, Australia," sent to him by Mr. George Clifton of Freemantle. To this sponge Dr. Gray, in 1867 (Proc. Zool. Soc. May 9, p. 546), gave the name of *Axos Cliftoni*, together with a short description of the flesh-spicule *only*. In 1870, Mr. Clifton wrote from Portland (Engl.) to Dr. Gray concerning this sponge (I possess the note) as follows:—"Some I dredged up; and others I secured on the beach after heavy gales. They are very common, and in some instances are over 6 feet in length, and when alive of a bright red colour." Finally, in 1873 (Proc. Zool. Soc. p. 321, pl. xxix.), Dr. Bowerbank gave a description, with most accurate illustrations, of this sponge (having been drawn on stone by his faithful artist, the late Mr. Lens Aldous), under the name of *Dictyocylindrus dentatus*; but as Dr. Gray's name of *Axos Cliftoni* is more applicable than *Dictyocylindrus*, Bk., to the nature and structure of the sponge (simply because it is not a *Dictyocylindrus*, Bk.*), and possesses the priority of half a dozen years, I shall adopt Dr. Gray's name as the generic appellation of those new species which I am about to describe. But before doing this it is desirable, for comparison, that I should briefly allude to the figures of the skeleton and flesh-spicules respectively of *Axos Cliftoni* in the dried state (Pl. XXVI. figs. 5, 6, *a–c*).

Thus the skeleton-spicule (fig. 5) is long, acuate, smooth, curved and sharp-pointed, 1-360th by 1-1800th inch in its greatest dimensions; and the flesh-spicule (fig. 6, *a*), which is stelliform and crucially sexradiate, has, when fully developed, a globular body surrounded by six thick short arms, equidistant from each other, and each arm terminated by four or more comparatively large spines, or with the arms thinner, expanded at their point of union in the centre, and terminated respectively at their free ends by a globular head, which is microspined (fig. 6, *b*)—both originating in small, simple, smooth-armed, sexradiate stars (fig. 6, *c*), from which every grade of development may be traced to the first-described form, which, in size, is 1-1200th inch in diameter, and, so far as is known, as remarkable as it is unique in figure.

Axos flabelliformis, n. sp. (Pl. XXVI. figs. 1–4.)

Flabelliform, plicate, papyraceous, sessile, aculeated over the surface, especially on the margin, which is undulating, convex, and plicate longitudinally. Colour white. Texture cork-like. Surface extremely irregular and pitted, which pits, in many parts, would be open fenestrations but for being tympanized with sarcode; thickly aculeated throughout (Pl. XXVI. fig. 1). Internal structure cellular or cavernous, influenced in the form of its cavities by the presence of a reticulated, anastomosing framework composed of a condensed sarcode (? chondroid when fresh) charged with skeleton-spicules, which extends into and forms the axial part of the spines respectively. Spicules of two kinds, viz.:—1, skeleton-, acuate, smooth, sharp-pointed, 1-66th by 1-3000th inch in its greatest diameter (fig. 2); and 2, flesh-spicule, stelliform, crucially sexradiate, with the rays short and expanded at their point of union in the centre; globular and microspined at their free ends; size about 1-1714th inch in diameter (fig. 3). Skeleton-spicules chiefly confined to the framework and the flesh-spicules to the surface-layer on each side. Size of entire specimen 4¾ inches high, 4½ inches wide, and papyraceous in thinness, except where thickened by the presence of the fibre composing the "framework."

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* The applicability of Dr. Gray's name in other respects may be learned from the following prefatory paragraph taken from his proposed arrangement of the Spongida, viz.:—"I may state that many of the names used for the genera have no derivations, but are mere fortuitous combinations of letters; so that compilers of indices of genera need not attempt to find derivations for them, or to correct the formation of some of them, as being more consistent with the derivations they may gratuitously assign to them, as has been done with some generic names of the same kind by Agassiz and others." (Gray, "Notes on the Arrangement of Sponges," P. Z. S., May 9, 1867, p. 500.)

Hab. Marine.

Loc. ? Australia.

Obs. Examined in the dried state. This specimen is in the British Museum, and, from possessing no number, must have been there for many years before the present "Register" was commenced. It bears the letter "*c*," and now has attached to it in addition my running-number, viz. 212, E, *h*, 20. The specimen is complete so far as the base or point of attachment and the circumference are concerned; while from the generally aculeated surface, form, texture, and spiculation, it may be seen to be chiefly allied to *Axos Cliftoni*; but the colour now is white or brownish, as it is in dried specimens of *Axos Cliftoni*, although in the fresh state it might have been "light red" like the latter as stated by Mr. Clifton.

Axos spinipoculum, n. sp. (Pl. XXV. figs. 1–9.)

Globo-cylindrical, oblong, massive, robust, thick, cup-shaped, excavated, sessile (Pl. XXV. fig. 1). Colour dark grey externally, whitish yellow within. Texture subcartilaginous and spongy respectively. Surface extremely irregular, deeply pitted here and there; thickly aculeated over the outside, less so over the surface of the excavation, which is deep, conical, and compressed. Aculeations short, thick, and stout, irregularly distributed, sometimes sharp-pointed, at others obtuse. Vents opening over the lower third of the outside, through simple holes in cribriform patches, chiefly in deep depressions between the aculeations, the "patches" overlying a larger cavity beneath, into which many excretory canals may open; or opening singly into the bottom of an excavation. Internal structure composed of dense, soft, spongy or areolar sarcode of a yellowish-white colour, charged with spicules, and probably bearing the spongozoa (fig. 4, *a a*), traversed by the fibrous skeleton of the sponge (fig. 4, *b*) and branches of the excretory canal-system (fig. 4, *e*), altogether defined outwardly by a tough transparent cortex (fig. 4, *c c*). Areolar sarcode filling up the interstices of the fibroskeleton, whose larger branches, being composed of chondroid substance charged exclusively with the linear spicules (fig. 2) arranged longitudinally, contrast strongly from their transparency with the opaque yellowish-white colour of the areolar sarcode, which they permeate in all directions, finally terminating in the aculeations of the surface (fig. 4, *d d*), where they are covered by the cortex thinning out towards their extremities. The dark grey cortical layer, which, on its part, also contrasts strongly in translucency and homogeneous appearance with the yellowish-white areolar sarcode which it limits towards the surface, is 1-24th inch thick, composed of wavy parallel fibres about 1-6000th inch in diameter (fig. 7, *a*), arranged horizontally, and traversed by a minute white tubular (?) reticulation (fig. 7, *b*), which appears to pass inwardly into vertical lines (fig. 7, *c*), altogether indicative of pore-tubulation opening into the subdermal cavities; wavy parallel fibres, when teased out, often presenting an attenuated extremity (fig. 8), and found to be composed of extremely fine fibrillæ (fig. 8, *a*). Excretory canals furnished with transverse circular folds like the *valvulæ conniventes* of the small intestine, often uniting into a *rugæ*-reticulation (fig. 5, *c c*); composed of three coats, viz. an inner, a middle, and an outer coat (viewing the surface of the canal as the outside); the inner coat consisting of wavy, parallel, translucent fibres, like those of the cortex, arranged longitudinally and in contact with the areolar sarcode (fig. 6, *a a a a*); the middle coat consisting of the same kind of fibres arranged transversely or circularly upon the last, and confined to the folds of the *rugæ* (fig. 6, *b b b*); and the outer coat of a mucous layer of cells and granular material (fig. 9), the cells in form frequently resembling those of the spongozoa, but *now* without the presence of the cilium (fig. 9, *a*). The longitudinal appear to be a little larger than the transverse fibres (that is, about as 1-6000th to 1-9000th of an inch in diameter), both being compounded of extremely fine fibrillæ like those of the cortex (fig. 8, *a*), of whose ultimate form I am ignorant; while the outer or epithelial layer, being apparently composed of mucus *only*, suspending and holding together a number of cells and granular material, thus contrasts strongly with the fibre-layer beneath. It should also be observed that this layer is *exclusively* charged with the flesh-spicules (fig. 3). Spicules of two kinds, viz. :—1, skeleton-, long, more or less straight, acuate, smooth, more or less abruptly sharp-pointed, 1-92nd inch long, by 1-4000th inch broad in the centre, which is slightly larger than the blunt end (fig. 2); 2, flesh-spicule, consisting of a straight shaft, spined at each end and in the centre; spines mostly recurved at the ends of the shaft, but often projecting in various directions, the terminal one frequently in a line with the shaft and the lateral ones recurved, thus hastiform (fig. 3, *a*), distributed generally about the centre of the shaft irregularly, but frequently aggregated into two circlets situated at equal distances from each other and the extremities (fig. 3); shaft, exclusive of the spines, about 1-375th inch long by 1-9000th inch broad. Skeleton-spicules chiefly confined to the chondroid fibrous skeleton; flesh-spicules to the epithelial layer on the surface of the excretory canals; both equally mixed in the areolar sarcode. Size of entire specimen $5\frac{3}{4}$ inches high, 4 inches in diameter at the upper or free end, 2 inches in diameter at the lower or fixed end; excavation conical, $3\frac{1}{2}$ inches deep; orifice compressed, elliptical, elongate, 2 inches by $\frac{7}{12}$ inch in its greatest diameters. Thus the wall at the brim is an inch thick; and increasing downwards, in accordance with the conical form of the excavation, just below the latter the sponge becomes at least 4 inches in diameter, continuing thus solid to the base. Hence the great general solidity and thickness characteristic of this sponge. The photographed representation, which has been lithographed (fig. 1), is about 4-6ths of the natural size.

Hab. Marine, on hard objects (fig. 1, *a a*).

Loc. Australia, Port Jackson.

Obs. Examined in the wet state. This remarkable sponge, now bearing the no. "619," came, as just stated, from Port Jackson, in Australia, and was presented to the British Museum by the late J. B. Jukes, Esq. It appears, from its present state, to have always been preserved in spirit as it now is, and thus rendered more satisfactory for examination than if it had been previously dried; for such is the difference between a sponge taken alive, immediately placed in spirit and kept in this state, and one that has been dried, that, for the most part, it may be fairly stated to lose more than one third of its natural characters by the latter method of preservation; while if it has been worn away by the action of the waves, and washed about on a beach, perhaps for years, before it is picked up for our museums, as most of the sponges in our collections are and must necessarily be from their inaccessible habitations, it may be easily conceived how unsatisfactory species-descriptions of a great number of specimens must indefinitely remain.

The rigid, aculeated surface, the soft opaque granular character of the areolar sarcode, the hard chondroid tissue of the fibro-skeleton, and the spiculation generally, although slightly modified in form, ally this sponge equally to *Axos Cliftoni* and *A. flabelliformis*, while the thick fibrous cortex and general solidity of the body constitute differences as great as they are peculiarly characteristic, so far as is known, of *Axos spinipoculum*.

The colour of the surface is now dark grey, as above stated, while that of *A. Cliftoni* and *A. flabelliformis* in the dried state respectively is white; but as Mr. Clifton has observed that "when alive" the former is "light red," this also may have been the case with *A. spinipoculum*; for it is worthy of notice that *Donatia* (olim *Tethya*) *lyncurium*, whose general structure and chondroid cortex closely resemble those of *A. spinipoculum*, is also light or orange red when alive, whether the specimen be British, Cape, or Australian, but loses this colour and becomes white or grey when dried or kept in spirit.

We thus analogically meet with the chondroid cortex of *A. spinipoculum*, so far as its cartilaginous nature goes, in *Donatia lyncurium*, which is also so nearly allied to the genus *Axos* in most other respects, that it seems necessary to place the latter in a neighbouring group. When portions of *A. spinipoculum* are dried, the cortex and skeleton assume the consistence and colour of dried glue, which is just the case with *Donatia lyncurium* under similar circumstances.

Nor should the striking likeness that exists between the aculeated surface of *A. spinipoculum* and the coarser forms of *Hircinia* pass unmentioned, from which, until the former is minutely examined, it might be very easily taken for the latter.

Another very striking character presents itself in the canals of the excretory system in *A. spinipoculum*, by which they are immediately distinguished from the branches of the chondroid skeleton in the midst of the areolar sarcode, viz. the transverse folds or *rugæ*, already described, which, but for the means of *touching* the branches (say with the point of a needle) when a section of the sponge is examined under water, would be sure to be taken for branched canals through optical delusion, so transparent is the cartilage against its point of contact with the opaque areolar sarcode.

These "folds" and the composition generally of the "coats" of the canals forming the excretory system are well worth attention. In the first place, when at most only 1-48th of an inch in diameter (fig. 4, *e*), they may, with a common lens, be seen to commence in the subdermal cavities (that is, just inside the cortex), and, joining each other, thus to become enlarged and finally terminate in the vents above mentioned; while if the "vertical lines" of the fine reticulation which is seen in the translucent cortex under water (fig. 7, *c*) are pore-tubes, as above suggested, which extend from the pores themselves on the surface to subdermal cavities as in other sponges, corresponding to those of the "investing membrane" of *Spongilla* ('Annals,' 1857, vol. xx. p. 25, pl. i. figs. 1, *b b*, "Ultimate Structure of *Spongilla*"), then I have already figured and described an excretory canal commencing in this way with the same kind of "folds" in *Greyella cyathophora* ('Annals,' 1869, vol. iv. pp. 192, 193, pl. vii. fig. 5, &c.).

It may be questionable how far the longitudinal and transverse fibres of the excretory canal, together with those of the cortex, may not be the same—and the whole, bundles of muscular fibrillæ; for the fibres lie parallel to each other, and are not united as in "elastic tissue."

Lastly, it may be conjectured that the cells of which the mucous layer or epithelium is composed were once monociliated, and that, when living, the action of the cilia was to propel the contents brought in through the pores &c. towards the vents respectively, so as to keep up that aqueous circulation which appears, while it brings in nourishment, to be also the process by which the respiratory and excretory functions of the sponge are accomplished.

The cribriform patches of vents overlying a large cavity, which is the combined end of several excretory canals below, also seems to indicate that this arrangement was for the better closing of these vents—which in *Spongilla* I have shown to be the case, for a while, after taking food ("Ultimate Structure," *op. et tom. cit.* p. 30). We may assume this also from the diaphragm sphincter of transparent sarcode often present and half-closed in the vents of the excretory canals of many sponges. As a necessary consequence, this should be attended by a closure of the pores also; and this, too, has been demonstrated in *Spongilla* (*loc. cit.*).

How delicate and transparent must be the muscular fibrillæ in these diaphragms, if such should exist here! and who can doubt it when observing the form and transparency of the infusorium *Euplotes*, whose legs, being as numerous and active as those of a crab, must have their moving powers all regulated by similar contrivances? yet we might as well look for these as the structure in glass! To assume that such fibrillæ do not exist because they are not appreciable by our senses is to assume that the finite can comprehend the infinite.

Of course I can say nothing of the "ampullaceous sacs," which are made up of the spongozoa ("Ultimate Structure of *Spongilla*," 1857, *loc. cit.*), the "*Wimperkörbe*" and "*Geisselkammern*" of the Germans, as these delicate parts have long since passed out of sight with the freshness of the sponge; but it is desirable to state here that Dr. F. E. Schulze, in a preeminent paper on the recent species of *Spongelia*, Nardo *apud* Schmidt (Spong. Adriat. Meeres, 1862, p. 28, = *Dysidea*, Johnston), has observed that the ultimate branches of the porc-tubulation open through numerous small holes or fissures into the ampullaceous sac (*Geisselkammer*), and that the latter, on the other hand, opens by one large one into the excretory canal (Zeitschrift f. wiss. Zool. 1878, Bd. xxxii. p. 134). This is somewhat different from what I have stated of *Spongilla* in 1857 (*op. et tom. cit.* p. 27, &c.), and may be more to the purpose; at the same time, as it is so easy to grow the young *Spongilla* from the seed-like body in a watch-glass, and, feeding it with carmine, to observe what takes place with a high power ($\frac{1}{4}$-inch objective), immersed, it would be desirable, since Dr. Schulze's description, although taken in part from living specimens, was not made under the same circumstances, to repeat the observations on *Spongilla* in the way that I have described (*loc. cit.*), always remembering that the soft parts of a sponge, being in their active state, ever changing in form like the *Amœba*, can apparently extemporize an aperture or close it, temporarily or permanently, wherever required. Dr. Schulze's paper and drawings are alike admirable, and the lithographed photographs a model for all time in the matter of sponge-representation.

Lastly, I would direct attention to the typical form given of the flesh-spicule of *Axos spinipoculum*, as a variety of that group which I propose to describe and illustrate hereafter under the name of "*Sceptrella*."

ECHINONEMATA, Cart.

Family 1. **Ectyonida**, Cart.

Genus TRIKENTRION, Ehlers.

In 1864, Dr. Bowerbank (Mon. Brit. Spongiadæ, vol. i.

p. 267, pl. x. fig. 234) gave a representation of a quadriradiate spicule, which is described as a specimen of a "spiculated inequiangulated triradiate" (? spined inequiangulated quadriradiate) spicule, with "cylindrical entirely spined radii" (? chiefly terminally spined), from "*Dictyocylindrus Vickersii*, Bk. MS." In 1877, Mr. T. Higgin, F.L.S. ('Annals,' vol. xix. p. 296, pl. xiv. figs. 9, 10), represented the same kind of quadriradiate accompanied by an acuate spicule, which he found in small quantity on the piece of rock supporting his *Higginsia coralloides*, which was brought from the West Indies. To this I alluded ('Annals,' 1876, vol. xviii. p. 391), from a mounted specimen kindly sent me by Mr. Higgin. In 1878 I found, in the late Dr. Bowerbank's collection, a fragment of the sponge from which his figured spicule was probably obtained, with the following label on it, viz. "*Dictyocylindrus Vickersii*, West Indies;" but as the rest of the spiculation, together with the sponge itself, has never been described or illustrated, I now propose to do this from the fragment mentioned under Dr. Bowerbank's name, which, so far as the characters of his genus *Dictyocylindrus* (Mon. Brit. Spong. vol. ii. p. 6, type *D. hispidus*, Bk., = *Raspalia*, Schmidt) go, is well-chosen.

Dictyocylindrus Vickersii, Bk. (Pl. XXVII. figs. 5–8.)

Fragment thick, triangular, wedge-shaped, composed of branched columnar structure, radiating from the inner angle, indicative of its having been broken out of a convex radiated mass (Pl. XXVII. fig. 5); columns hollow, tubular, smooth within and rough without, wherein the spicules are implanted (fig. 8); branches terminating in lacinulated heads, which, in juxtaposition, form the convex or outer surface. Colour now black-brown. Texture loose, hollow, columnar, not fibrous. Surface of the columns setose from the projection of the long spicule (fig. 8, *a*). Wall of columns composed of dark brown areolar sarcode, charged, on the *outside*, with the spicules of the species. Spicules of four different forms, viz.:—1, long, setose, acuate, smooth, slightly curved, sharp-pointed, 1-14th by 1-1800th inch in its greatest diameter (fig. 6, *a*); 2, short, thick, acuate, smooth, slightly curved, towards the blunt end chiefly, sharp-pointed, 1-45th by 1-900th inch (fig. 6, *b*); 3, fine, acuate, irregularly undulating, smooth, slightly inflated in the centre, sharp-pointed, 1-51st inch long and of extreme thinness (fig. 6, *c*); 4, echinating spicule, quadriradiate, arms cylindrical, more or less obtuse, for the most part equal in length, and radiating at nearly equal angles from each other, each spined, chiefly over the free extremity, about 1-360th inch long by 1-1800th broad, the echinating arm a little longer than the rest, sharper, and standing out from the others at a greater angle (fig. 6, *d*, and fig. 7). Nos. 1 and 2 project obliquely upwards and outwards from the surface; no. 3 is sparsely mixed among them, and no. 4 very plentifully distributed about their fixed ends (fig. 8, *a*, *b*, *c*, *d*). No. 4 also is often quinqueradiate (fig. 6, *e*), and as often presents itself under the form of three- and four- smooth-armed radiates whose rays are sharp-pointed (fig. 6, *f*, *g*). Size of fragment about 1 inch long in the direction of the radiated structure (that is, vertically), and ¼ inch thick.

Hab. Marine.

Loc. West Indies.

Obs. Examined in the dried state. From the dirty and insignificant appearance of this fragment, which appears to represent the total vertical thickness of the sponge, it is not improbable that, growing on rocks in shallow muddy water in the form of a crust with plane and unbranched surface, it has often been overlooked. Nevertheless, from the above description, it is evidently very desirable that better specimens of it should be obtained; for being one of the Echinonemata in which *radiate* spicules at once like those of *Pachastrella* and those of the Calcispongiæ are present, it is important that this fact should be made public, as the two following sponges are, in spiculation, allied to it, and all might be confounded, in the fossil state, with the Calcispongiæ, if the latter were *alone* supposed to contain the triradiate and quadriradiate spicules, as Mr. Sollas's illustrations and descriptions of his fossil genus "*Catagma*" show ('Annals,' 1878, vol. ii. p. 353, &c.).

The splitting-up or subdivision of the columnar structure towards the surface into lacinulated heads is a common feature of *Dictyocylindrus*, but not less characteristic of the surface of many of the Echinonemata, where the projecting lacinula may vary in form from flat to round, being frequently spatulate or tongue-shaped with a caudate extremity.

Trikentrion muricatum, Ehlers, 1870.
(Pl. XXVII. fig. 13.)

In 1756 Pallas (Elench. Zoophytorum, p. 389. no. 237) described this sponge under the name of *Spongia muricata*, stating, on the authority of Seba, that it comes from "Guinea." In 1794 Esper (Die Pflanzenthiere &c. pl. 3) figured and described it under the same name from a specimen now in the museum at Erlangen, which, after microscopic examination, Dr. Ehlers, in 1870, considered it desirable to distinguish by the generic name of "*Trikentrion*" (Esper'schen Spongien &c. in der zool. Samml. der k. Universität Erlangen). Finally, Mr. Sollas, in January last, published an account of it from a specimen in the Bristol Museum, under the name of *Plectronella papillosa*, as "a new Genus and Species of Echinonematous Sponge" ('Annals,' 1879, vol. iii. p. 17, pls. iv.–vi.).

Of this sponge there are several specimens in the British Museum, whose spiculation consists of tufts of smooth, curved, acerate spicules attached to indistinct or ill-defined fibre, echinated with triradiate spicules, one of whose arms is cylindrical, obtuse, spined especially over the free end, and three times the length of either of the other two, which are comparatively short, smooth, sharp-pointed, and fixed in the sarcode, the long, spined arm being the echinating one (Pl. XXVII. fig. 13, *a*, *b*, *c*, *d*).

All the specimens come from the western coast of Africa; and each bears my running no. 252, D, *h*, 1, also respectively the nos. 31 *a*, 41. 5. 13. 37, and 72. 10. 9. 1, to the last of which is added "Volta, Fantee, presented by Governor Ussher." With them will be found another but much smaller sponge, numbered 252 *a*, D, *h*, 2, and 48. 10. 4. 6, which, differing from the foregoing in spiculation and general form, though also from the west coast of Africa, claims the following distinctive appellation and description.

Trikentrion læve, n. sp. (Pl. XXVII. figs. 9–12.)

Specimen a small globular bunch of short, cylindrical, obtuse branches, arising from the subdivision of a small, equally short, round stem. Colour now purplish. Texture loose, compressible. Surface even, reticulate, slightly setose. Structure throughout fibro-reticulate, charged with the spicules of the species (Pl. XXVII. fig. 10). Spicules of three forms, viz.:—1, long, setaceous, acuate, smooth, curved, sharp-pointed, 1-33rd by 1-3600th inch in its greatest diameters (fig. 9, *a*); 2, short, acerate, smooth, curved, sharp-pointed (fig. 9, *b*), 1-120th by 1-3600th inch, sometimes bent in the middle (fig. 11, *a*), or inflated in the centre (fig. 11, *b*), occasionally acuate (fig. 11, *c*); 3, echinating spicule, triradiate, arms cylindrical, obtuse, about 1-200th by 1-2000th inch in their greatest dimensions, for the most part equal in length and radiating at nearly equal angles from each other, the echinating arm alone spiniferous, chiefly over the free extremity, the two others smooth (fig. 9, *d*, and fig. 12, *a*–*c*), occasionally quadriradiate (fig. 12, *b*, *c*). No. 1 (fig. 10, *a*) projects setaceously from the midst of a tuft of very thin acuates (fig. 10, *c*); no. 2 (fig. 10, *b*) chiefly forms the fibre; and no. 3 is the echinating spicule, plentifully distributed about the latter (fig. 10, *d*). Size of entire specimen about 1 inch, and the branches about 3-24ths inch in diameter respectively.

Hab. Marine.

Loc. West coast of Africa.

Obs. Examined in the dried state. This sponge, numbered as above mentioned, may be found in a little pill-box in the British Museum, and was presented by the Rev. Mr. Allen. To render it more easily recognizable, it bears on its surface the remains of a parasitic polype (*Palythoa*). Its spiculation is very much like that of *Trikentrion muricatum*, but has, in addition, the setaceous acuate very common among this kind of sponges, although absent in *T. muricatum*. When, however, the general form and internal structure of *T. læve* is compared with *T. muricatum*, there is a still greater difference; for while the surface of the latter is covered with little conical processes of the sponge-substance (another common feature of many of the Echinonemata, particularly well-shown in Esper's and Mr. Sollas's representations of this sponge respectively), that of *T. læve* is even and setaceous, more like that of a *Dictyocylindrus* or *Axinella*, Sdt.; again, while the structure generally of *T. læve* is composed of loose or compressible, reticulated fibre, that of *T. muricatum* is just the opposite, viz. hard, dense, and compact, becoming still more so towards the axis of the branch—another character almost peculiar to many of the Echinonemata. These, together with other differences, viz. in size, colour, and general form, are ample for making *T. læve* a distinct species; but it is remarkable that both this and *T. muricatum* should come from the west coast of Africa, and that, as yet, they should not have been shown to have come from any other part of the world, even going so far back as Pallas in 1756.

DICTYOCYLINDRUS, Bk.

Order ii. Silicea, Suborder i., Genus 10 (pp. 3, 6, *op. et loc. cit.*).

Allied to the genus *Trikentrion*, and typical of one of the groups into which the Pluriformia will hereafter have to be divided, is Dr. Bowerbank's genus *Dictyocylindrus*, which, so far as his diagnosis goes (*op. cit.* p. 6), is well defined, but would have been better if the echinating spicule, although very sparse in many species, had been mentioned, as this at once would have placed it in my order Echinonemata, under the family Ectyonida. My object, however, in introducing the subject here is, first, to point out that the echinating spicule of *Dictyocylindrus* is the preceding grade in form to the more complicated one of *Trikentrion*—that is, while the former may be viewed as a single arm fixed to the fibre by an inflated and spined extremity (Pl. XXVII. fig. 14), the latter presents a more complicated one, in which this is effected by two additional divergent arms, making the spicule triradiate,—and, secondly, to take this opportunity of recording the descriptions, respectively, of two remarkable species of the genus illustrative of this, which were found by Col. Pyke (U.S. Consul) at the Mauritius, and sent to me by Dr. Dickie, late Professor of Botany in the College at Aberdeen, in 1872. For one of these I propose the name of *Dictyocylindrus laciniatus*, and for the other *D. Pykii*, commencing with the former first.

Dictyocylindrus laciniatus, n. sp.

(No figures are given of this and the following species, beyond the echinating spicule, which is the same in both.)

Hemisphcroidal, laciniate, radiating, sessile. Colour light slate-grey. Texture tender, compressible. Pores and vents not visible, the latter probably from their smallness, owing to the excretory systems in this kind of sponges being much subdivided. Structure consisting of long spatulate laciniæ, radiating from a basal point, dividing and subdividing upwards, proliferous, plicate, and slashed towards the surface; composed of indistinct, anastomosing fibre, charged with the spicules of the species; setigerous or hairy throughout from the projection of the long acuates, which will now be described. Spicules of three forms, viz.:—1, very long, setaceous, acuate, smooth, curved, sharp-pointed, slightly inflated, pin-like at the base, 1-6th inch long by 1-750th inch broad in its greatest dimensions; 2, acerate, curved, smooth, sharp-pointed, 1-45th by 1-1500th inch; 3, echinating spicule, short, acuate, conical, straight, inflated at the base, subpointed at the free extremity, spiniferous, spines most numerous about the extremities respectively, slightly recurved about the free end, 1-272nd inch long by 1-1500th in diameter at the inflated end. No. 1 is based in the indistinct fibre (which is chiefly formed of no. 2), and, projecting from the surface of the lacinia obliquely upwards, gives the latter, from its great length, a strongly setose character; while no. 3 sparsely echinates the fibre. Size of specimen 2 inches in diameter.

Hab. Marine, growing on hard objects.

Loc. Mauritius.

Obs. Examined in the dried state. This specimen had grown on a branch of decayed coral, and, from the quantity of sand in it, was probably picked up upon the beach. Its hemispheroidal form, long radiated laciniate structure, great length and projection of the long acuate, together with the light slate-colour mentioned, are its principal characters.

It is also remarkable for the presence of a number of malformations of the long setaceous spicule, consisting of globular and elliptic bodies composed of concentric layers, thus traceable through their elongated forms into the normal development. Not an uncommon occurrence.

Dictyocylindrus Pykii, n. sp.

Subglobular, clathrous, massive, sessile. Colour dark purple. Texture tender, loose. Surface uniformly composed of the ends of the clathrous structure. Pores and vents not seen, the latter for the reason just mentioned. Internally consisting of clathrous anastomosing branches, composed of indistinct fibre charged with the spicules of the species, and tympanized by the dark purple sarcode characteristic of the sponge. Spicules of three forms, viz. :—1, setaceous, acuate, curved, smooth, sharp-pointed, 1-18th long by 1-1800th inch in its greatest transverse diameter; 2, acerate, smooth, curved, sharp-pointed, 1-50th by 1-1800th inch in its greatest dimensions; 3, echinating spicule, acuate, conical, straight, inflated at the base, subpointed at the free extremity, spiniferous, spines most numerous over the extremities, slightly recurved about the free end, 1-272nd long by 1-1500th inch in diameter at the inflated end, the same in form as the last (Pl. XXVII. fig. 14). No. 1 projects obliquely upwards from the fibre, which is formed of no. 2, so as to give the surface of the clathrous structure a slightly setose character; while no. 3 in great abundance forms the echinating spicule. Size of specimen 3½ inches high by 3 inches in diameter between the base and the summit, which is the largest part of the sponge.

Hab. Marine, growing on hard objects.

Loc. Mauritius.

Obs. Examined in the dried state. This sponge is chiefly remarkable for its deep purple colour, presenting, in this respect, the appearance of Mr. T. Higgin's *Halichondria birotulata*; but the clathrate structure and echinated fibre, together with the spiculation generally, at once point out the difference. The indistinctness of the fibre in this and the foregoing described species is chiefly owing to the projection of the long setaceous and echinating spicules. Still there is a great difference between the loose and the compact structure respectively characterizing these echinated sponges, as seen between *Trikentrion lœve* and *T. muricatum*, the latter resembling in its structure that density and hardness which seems to me, as before stated, to exclusively belong to some of the Echinonemata, while the looser structure is common to all orders of the Spongida.

Latruncula corticata, n. sp. (Pl. XXVII. figs. 1–4.)

Erect, solid, lobate, covered with a thin chondroid dermal layer, apparently (the point of attachment having been broken off) subsessile (Pl. XXVII. fig. 1). Colour now yellowish white. Texture chondroid on the surface (fig. 1, *a*); reticulated, stiff, gum-like internally (fig. 1, *b*). Surface smooth as varnish to the unassisted eye; but under the microscope presenting the pointed ends of the skeleton-spicules in groups, just projecting beyond the chondroid layer, which is papyraceous in thinness (fig. 2, *b*). Pores between the groups, now 1-1200th inch in diameter and about 1-333rd inch apart (fig. 2, *a*). Vents not seen, chiefly on account of the imperfect state of the specimens. Internal structure fibroreticulate, stiff, arranged so as to present a plumose apprearance; fibre composed of the spicules of the species held together by the now dried, glutinous sarcode. Spicules of two kinds, viz.:—1, skeleton-, acerate, curved, smooth, sharp-pointed gradually, 1-60th by 1-4000th inch in its greatest diameters (fig. 3); 2, flesh-spicule, stout, straight or crooked (subspiral), spined, 1-857th inch long (fig. 4); spines grouped at the ends and on the shaft in two places respectively at equal distances from each other (fig. 4, *a*), or dispersed more or less generally over the shaft (fig. 4, *b*), or subspirally, giving the flesh-spicule a crooked form (fig. 4, *c*). Skeleton-spicules mixed with the flesh-spicules in the interior, the latter most abundant on the surface. Size of the largest specimen 3 × 2½ inches.

Hab. Marine.

Loc. Red Sea (so stated by the dealer).

Obs. Examined in the dried state. There are three fragmentary specimens of this sponge in the British Museum, which look as if they had all come from the same mass. Each bears my number 359 E, *h*, 23, and the register numbers 40. 5. 6. 56–58. Its generally stiff consistence, rendered flexible by soaking, makes it look very much like one of the Gumminida; while the transitionary forms of the flesh-spicule (fig. 4, *a*, *b*, *c*) show how the shaft may be spiral like that of the spinispirular, or straight like that of the sceptrella, whose typical forms respectively will be pointed out hereafter.

Chondrilla sacciformis. (Pl. XXVI. figs. 9, 11, and 12.)

Saccular and cylindrical (Pl. XXVI. figs. 9 *a*, 9 *a*), or adnate and depressed (fig. 9 *b*) ; sessile, corticate. Colour dark brown. Texture stiff and hard externally, soft internally when dry, chondroid and flexible when wet. Surface even, formed of the globular spicules (fig. 12) arranged in a tessellated manner like shagreen. Pores uniformly present all over the surface between the globular spicules, provided respectively with a sphinctral diaphragm of sarcode, 1-164th inch in diameter and a little wider apart. Vents single and large at the end of the sacciform growth (figs. 9 *a*, 9 *a*), or numerous and scattered over the adnate portions (fig. 9, *b*, *c*), projecting and papillary when wet. Structure cortical and internal; cortex stiff and hard when dry, about 1-138th inch thick, chondroid and flexible when wet, charged with the globular spicule and traversed by the canals of the pores and vents, respectively ending in their apertures on the surface; internal structure compressible, tough, resilient, consisting of areolar sarcode charged with groups of brown pigment granules (which give the colour to the sponge) and the spicules of the species, traversed by the branches of the excretory canal-systems. Spicules of two kinds, viz. :—1, skeleton-, acerate, smooth, curved, sharp-pointed gradually, 1-25th by 1-900th inch in its greatest dimensions (fig. 11) ; 2, flesh-spicule, spherical, globo-stellate, moriform, 1-225th inch in diameter (fig. 12) ; granules arranged hexagonally (fig. 12, *a*), conoid, truncate, and spined over the extremity (fig. 12, *b*), or simply conoid (fig. 12, *c*). No. 1 (spicule) is confined to the internal structure, mixed with no. 2 in different stages of development; no. 2 in full development, exclusively to the cortex. Size of largest sacciform portion about 1½ inch long by ½ inch in diameter, that of the adnate portions various.

Hab. Marine, on hard bodies.

Loc. Mauritius.

Obs. Examined in the dried state and after soaking in water. In the former it is stiff, hard, and corrugated, while in the latter it is soft, flexible, and smooth. The globo-stellate or moriform spicule, although a strikingly beautful object *in situ*, and separate from its great size, is but an enlarged form of that of *Chondrilla nucula*, Sdt., which, together with *Chondrosia*, Nardo, also occurs at the Mauritius. *C. nucula* also grows in the West Indies and at the Molucca Islands, in the South Pacific Ocean, so that it probably has a world-wide extension in the warmer climates. The presence of the acerate spicule makes it differ from *Chondrilla nucula*, and together with its erect growth, remarkably large globo-stellate spicules, and rich dark brown colour are its distinguishing characters. The specimens from which my description is taken, now in the possession of the British Museum, were presented to the late Dr. Bowerbank by Dr. Ayres, and bear my running no. 701. According to Dr. F. E. Schulze's arrangement (Zeitschrift f. wiss. Zool. 1870, Bd. xxix. p. 37, Separat-Abdruck), *Chondrilla sacciformis*, from possessing a cortex, would be one of his family "Chondrosiadæ." His recension of the species generally I commend to the student's notice, as well as all Dr. Schulze's papers on the Spongiadæ (*op. cit.*), as affording, so far as they go, some of the most valuable information that has ever been communicated on the recent sponges.

Schmidt has described and illustrated a sponge under the name of *Chondrilla phyllodes* (Grundz. Spongienf. atlantisch. Geb. 1870, p. 26, Taf. vi. fig. 1), with pin-like skeleton and spinispirular flesh-spicule, possessing a "violet-brown colour." A similar sponge occurs at the Mauritius, which, possessing none of the characters of a Gummina, I have set down as a Suberite—that is, belonging to the family Suberitida in my order Holorhaphidota. No doubt there are many species among these Suberitida which come very near to those that undoubtedly belong to the Gumminida in the order Carnosa, e. g. *Donatia lyncurium* &c. The preceding species, viz. *Latruncula corticata*, would, if the chondroid consistence were to be considered the distinguishing character of the Gumminida, be made one, like *Chondrilla phyllodes*.

The application of the term "spicule" to the globo-stellate seems ill adapted; but "body," which has often been used, is worse, as it conveys no idea of the *nature* of the object; while the term "spicule," if, apart from its derivation, applied to the siliceous elements of a sponge which have a definite form, whatever it may be, is readily understood. Otherwise a "globo-stellate spicule" would be as unintelligible as a "round square."

Rhaphidhistia spectabilis, n. sp.
(Pl. XXVI. figs. 10, 13, and 14.)

Lamelliform, extremely thin, sessile, taking the shape of the surface over which it may have grown, like a wet veil (Pl. XXVI. figs. 10, 10). Colour now whitish yellow. Texture delicate. Surface even, puckered here and there into little monticular projections (fig. 10, *a*), which appear to have been surmounted by the vents, otherwise (together with the pores) not recognizable. Internal structure loose, consisting of delicate areolar sarcode charged with the spicules of the species. Spicules of two kinds, viz.:—1, skeleton-, acerate, long, curved, smooth, pointed gradually, 1-40th by 1-1800th inch in its greatest diameters (fig. 13); 2, flesh-spicule spinispirulate, straight or curved irregularly, variable in length and thickness, the longest averaging 1-300th by 1-3000th inch in its greatest diameters (figs. 14 and 14 *a*). Spicules of both kinds equally mixed throughout the structure. Largest specimen about 1 inch square and of extreme thinness.

Hab. Marine, on hard objects.

Loc. Mauritius.

Obs. Examined in the dried state. There are several patches of this sponge, of various sizes under that mentioned, on fragments of old reef-coral which bear the name "Dr. Ayres," in the late Dr. Bowerbank's collection; three of them are on that bearing the specimens of *Chondrilla sacciformis*, just described. Being loose and crumbling in its consistence, both when dry and after soaking in water, it fails to present the chondroid peculiarity of the Gumminida, while its Holorhaphidote character and spiculation seem to claim for it a place in the family Suberitida. The spinispirulate flesh-spicule is a common form under various phases among the Suberitida; and one of the average largest specimens in *Rhaphidhistia spectabilis*, presenting *ten bends*, has been represented under a highly magnified form, perhaps with a little more regularity than is natural, to show its elementary figure and composition (fig. 14 *a*). It is a strikingly beautiful object, separately or together, in *Rhaphidhistia spectabilis* when viewed under the microscope, and hence the specific designation. When alluding to the different forms assumed by the spinispirula hereafter, it will be more particularly noticed.

Hymeraphia spiniglobata. (Pl. XXVI. figs. 15, 16.)

Laminiform, immeasurably thin, taking the form of the object over which it may be growing. Colour pellucid white. Texture loose. Surface even, echinated with long spicules. Pores, vents, and internal structure not recognizable in the dried state, from the extreme thinness of the layer. Spicules two kinds, viz.:—1, skeleton-, pinlike, straight, fusiform, sharp-pointed gradually, 1-43rd by 1-1500th inch in its greatest diameters; head terminal, globular, a little larger in diameter than the shaft (Pl. XXVI. fig. 15); 2, flesh-spicule, spiniglobate or spiniglobospiral, the former about 1-857th inch in diameter (fig. 16, *a*, *b*, *c*, *d*). Skeleton-spicules projecting from a thin layer of the flesh-spicules. Size of largest specimen 3-12ths inch in horizontal diameter.

Hab. Marine, on hard objects.

Loc. South Sea, on the older and deciduous parts of *Stylaster sanguineus.*

Obs. Examined in the dried state. The beautiful spiculation of this delicate little sponge is remarkable, when dry, for its pellucid white colour. It is so thin that much care is required in raising a portion for examination by the microscope, without which, even *in situ*, it can hardly be recognized. Answering to Dr. Bowerbank's characters of his genus *Hymeraphia* (Mon. Brit. Spong. vol. ii. p. 7), I have given it this appellation, together with the specific distinction of "spiniglobate," to mark the existence of a globular flesh-spicule with thin spines instead of thick conoid rays, like the "globostellate" of *Donatia lyncurium*, accompanied by the subspiral transitionary form (fig. 16, *b*, *d*), which illustrates the connexion between the spinispirular (*Spiralstern*) and the stellate, noticed by Schmidt in accounting for the differences between his two figures of the spiculation of *Vioa Johnstonii* (Spongienf. d. atlant. Geb. 1870, p. 5).

EXPLANATION OF THE PLATES.

PLATE XXV.

Fig. 1. *Axos spinipoculum*, n. sp. (4-6ths of the natural size). From a photograph. *a a*, pieces of old coral detritus on which the sponge has grown.

Fig. 2. The same. Skeleton-spicule (scale 1-24th to 1-6000th inch). *a*, length on scale of 1-24th to 1-1800th inch, for comparison.

Fig. 3. The same. Flesh-spicule. *a*, occasional form of terminal spines (same scale).

Fig. 4. The same. Diagram of elementary parts, relatively magnified (on scale of 1-6th to 1-24th inch), showing:—*a a*, yellowish-white areolar sarcode; *b*, chondroid skeleton; *c c*, cortical layer, traversed by reticulation of ? pore-canals (fig. 7, *b*); *d d*, spines; *e*, portion of commencement of excretory canal, lined with transverse folds or rugæ.

Fig. 5. The same. Portion of commencement of excretory canal, much more magnified, showing:—*a a a*, wall of canal; *b b b*, openings into smaller branches; *c c c*, transverse folds or rugæ.

Fig. 6. The same. Inner layer of excretory canal, greatly magnified, showing that it is composed of:—*a a a a*, longitudinal fibres; *b b b*, transverse fibres, corresponding in position with the rugæ.

Fig. 7. The same. Cortical layer, much magnified, to show:—*a*, horizontal fibres; *b*, minute reticulation; *c*, vertical lines or straight portions of the same, terminating on the inner side.

Fig. 8. The same. End of single fibre, to show its pointed form, and that the fibre is made up of fibrillæ (*a*).

Fig. 9. The same. Epithelial or outer layer of the excretory canal, to show that it is composed of a granular mucus charged with cells. *a*, cells, magnified, to show their prevailing shape.

PLATE XXVI.

Fig. 1. *Axos flabelliformis*, n. sp. (3-5ths of the natural size). From a photograph.
Fig. 2. The same. Skeleton-spicule (scale 1-24th to 1-6000th inch).
Fig. 3. The same. Flesh-spicule (same scale).
Fig. 4. The same. Length of skeleton-spicule on scale of 1-24th to 1-1800th inch, for comparison with fig. 7 of same Plate and fig. 2, Pl. XXV.
Fig. 5. *Axos Cliftoni*, Gray. Skeleton-spicule (scale 1-12th to 1-1800th inch).
Fig. 6. The same. Flesh-spicules. *a*, common form; *b*, less common form; *c*, ? embryonal form (scale 1-24th to 1-6000th inch).
Fig. 7. The same. Length of skeleton-spicule on the scale of 1-24th to 1-1800th inch, for comparison.
Fig. 8. Portion of coral detritus bearing *Chondrilla sacciformis* (9) and *Rhaphidhistia spectabilis* (10), nat. size.
Figs. 9, 9, 9. *Chondrilla sacciformis*, n. sp. (nat. size). *a a*, saccular forms; *b*, adnate form; *c*, vents, papillary.
Figs. 10, 10. *Rhaphidhistia spectabilis*, n. sp. (nat. size).
Fig. 11. *Chondrilla sacciformis*. Skeleton-spicule (scale 1-24th to 1-1800th inch).
Fig. 12. The same. Flesh-spicule (same scale). *a*, portion of the granular mulberry-like surface, more magnified, to show the arrangement and form of the "granules" *in situ*; *b*, lateral view of a single granule, showing spinous truncate extremity; *c*, the same, simple conical form.
Fig. 13. *Rhaphidhistia spectabilis*. Skeleton-spicule (scale 1-24th to 1-1800th inch).
Fig. 14. The same. Flesh-spicule (same scale). *a*, the same, much more magnified, to show the sinuous (spiral) form of the shaft and spiral arrangement of the spines.
Fig. 15. *Hymeraphia spiniglobata*, n. sp. Skeleton-spicule (scale 1-12th to 1-1800th inch).
Fig. 16. The same. Flesh-spicule. *a*, spheroidal or globular form, same scale; *b*, spiro-globular form; *c*, *d*, the same, more magnified, to show the spines and figures respectively.

PLATE XXVII.

Fig. 1. *Latruncula corticata*, n. sp. Natural size of specimen. *a*, chondroid layer or cortex; *b*, internal structure.
Fig. 2. The same. Surface of cortex, much magnified, to show:—*a*, pores; and *b*, points of skeleton-spicules, relatively situated.
Fig. 3. The same. Skeleton-spicule (scale 1-12th to 1-1800th inch).
Fig. 4. The same. Flesh-spicule (scale the same). *a*, *b*, *c*, the same, more magnified, to show the transitionary forms present, viz.:—*a*, sceptrella; *b*, intermediate form between the sceptrella and (*c*) the spinispirular form.
Fig. 5. *Dictyocylindrus Vickersii*, Bk. Fragment. Natural size.
Fig. 6. The same. Spiculation relatively magnified (scale 1-24th to 1-1800th inch). *a*, long setaceous acuate; *b*, thick short acuate; *c*, undulating acuate; *d*, echinating quadriradiate spicule; *e*, quinqueradiate form; *f*, smooth-armed triradiate form; *g*, the same, quadriradiate.

Fig. 7. The same. Echinating spicule, more magnified (scale 1-12th to 1-1800th inch). *a*, echinating arm.

Fig. 8. The same. Portion of *surface* of a "column," showing the spicules *in situ*. Diagram, much, but relatively, magnified. *a*, long setaceous acuate; *b*, thick short acuate; *c*, undulating acuate; *d*, echinating spicule.

Fig. 9. *Trikentrion læve*, n. sp. Spiculation relatively magnified (scale 1-24th to 1-1800th inch). *a*, long setaceous acuate; *b*, short thick acerate; *c*, fine acuate; *d*, echinating triradiate spicule.

Fig. 10. The same. Portion of fibre showing the spicules *in situ*. Diagram much, but relatively, magnified. *a*, long setaceous acuate; *b*, short, thick acerate; *c*, fine acuate; *d*, echinating triradiate spicule.

Fig. 11. The same. Different forms of acerate spicule, viz.:—*a*, bent; *b*, inflated in the centre; *c*, acuate.

Fig. 12. The same. Echinating spicule, more magnified (scale 1-12th to 1-1800th inch). *a*, normal form, triradiate; *b*, occasional form, quadriradiate; *c c*, echinating arms. For comparison with figs. 7, 13 *c*, and 14, all of which are drawn on the same scale.

Fig. 13. *Trikentrion muricatum*, Ehlers. Portion of fibre, showing the spicules *in situ*. Diagram, but relatively magnified (scale 1-48th to 1-1800th inch, the same scale as figs. 8 and 10, for comparison). *a*, acerate spicule; *b*, echinating triradiate spicule; *c*, the latter more magnified; *d*, echinating arm.

Fig. 14. *Dictyocylindrus laciniatus*, n. sp., and *D. Pykii*, n. sp. Echinating spicule.

[To be continued.]

XXXIV.—*Studies on Fossil Sponges.*—III., IV., V. *Monactinellidæ, Tetractinellidæ, and Calcispongiæ.* By KARL ALFRED ZITTEL [*].

III. MONACTINELLIDÆ, Zittel.

In my memoir "Zur Stammesgeschichte der Spongien" [†], I adopted the following orders of sponges, founded chiefly upon the grouping proposed by O. Schmidt (Atlant. Spong. p. 83), namely:—1. Myxospongiæ, Häck.; 2. Ceraospongiæ, Bronn; 3. Monactinellidæ, Zitt.; 4. Tetractinellidæ, Marsh.; 5. Lithistidæ, O. Schmidt; 6. Hexatinellidæ, O. Schmidt; 7. Calcispongiæ, Blainv.

To the Monactinellidæ I refer all sponges the skeleton of which consists of *uniaxial siliceous spicules.*

Of the numerous uniaxial siliceous spicules from Tertiary

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[*] Translated by W. S. Dallas, F.L.S., from the 'Abhandlungen der k. bayerischen Akademie der Wissenschaften,' II. Classe, Bd. xiii. pp. 93–138.

[†] Festgabe der philosophischen Facultät zum 50-jährigen Doctorjubiläum des Professor von Siebold. Munich, 1878.